ANALYSIS OF THE C/N RATIO DISTRIBUTION IN MEDITERRANEAN FOREST SOILS.

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RÉSUMÉ:On étude l'application des courbes %C - C/N pour caractériser la minéralisation de l'azote en sols forestiers du NE de l'Espagne.Les courbes permettent la séparation objective des horizons organiques avec immobilisation de l'azote,des horizons organiques avec minéralisation nette de l'azote et des horizons minéraux avec immobilisation de l'azote dans les substances humiques; la transition entre les deux antérieurs serait l'horizon A1.

The C/N ratio has been largely used as an index of the evolution of soil organic matter.There are a lot of studies on the variations of the C/N ratio in time and its interpretation.In the present work,the use of C/N ratio distribution in relation to %C curves is proposed as a spatial expression of the process. The relation between time and space (depth from fresh litter)is applicable to undisturbed soils and,particularly,to forest soils in which the entrance of organic residues to the soil is very directionalized.

Most of the Mediterranean forest soils have no significant humus traslocation and consequently decrease of organic matter in depth is regular.Therefore,the %C is an objective expression of the horizon sequence when comparing soils,without having to assing a often subjective limit between organic and mineral horizons and the corresponding depths.

In the figure,the %C-C/N curves of three sets of soils are compared.Two types of soil have the same climatic and mineralogical characteristics but different vegetation,while the third has different lithologic and climatic conditions but the same vegetation as one of the previous two.From the curve analysis, the following conclusions are taken:

a) Fractions larger than 2 mm:layers L and a part of F.At high %C values there is net N immobilization as is revealed by the strong decrease in the C/N ratio with relatively small variations in the organic carbon.The points are quite sparse,probably due to the variability in the content of lignified fragments and to the fact that part of these layers are very labile and may vary with the sampling time and local conditions.In some cases,in the same soil profile an increase in %C in the F layer with respect to the L layer is observed.This coincides with a N increase and necessarily with a very low increase in ash.The L layer from Pinus has greater C/N ratios than that from Quercus.

b) Fractions smaller than 2 mm:

1) Asymptotic section of the curves,parallel to the %C axis: it corresponds to the F and H layers and it would connect with those points of the F fraction that are larger than 2 mm.In these horizons there is a net N mineralization,showed by the considerable decrease in organic carbon with an almost constant C/N ratio up to an approximate %C of 5.A segregation

of the curves is observed, in which the pine soils have the greatest C/N ratio, followed by acidic Quercus ilex soils. Therefore, in these layers the differences in vegetation, substrate and climate are reflected in the C/N ratio.

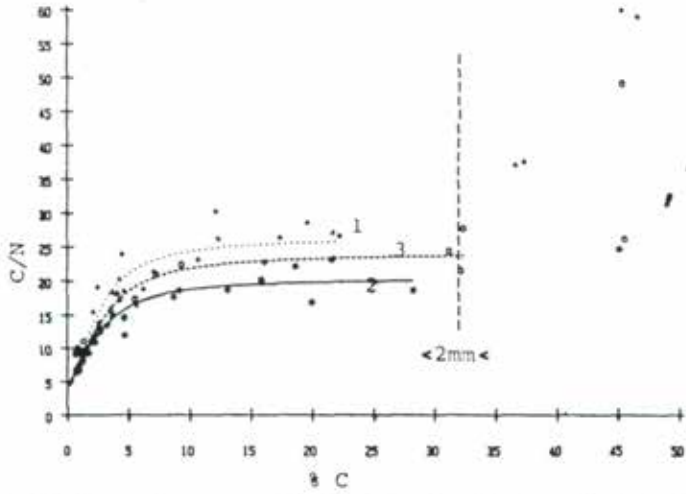

FIGURE: calcareous Lithic Torriorthent and L.Carborthid over marl from the Central Basin of Catalonia, P= 450mm, T = 14 °C (yearly means) with different forest type: curve 1 (+): Pinus halepensis and Pinus nigra; curve 2 (*): Quercus ilex ssp. rotundifolia. Acidic Lithic Xerorthent, Lithic and Fluventic Xerochrepts, over shales from the Montseny mountains, P= 900 mm, T = 10 °C, forest type: Quercus ilex ssp. ilex, curve 3 (o).

2) Section in which the curves change the slope: it corresponds to the mineral horizon of organic matter incorporation, A1, where still little-transformed remains are found together with humified ones. These horizons are rich in worm casts. Because of the mixing, the points are somewhat scattered. In the three types of soils, the A1 horizon so defined ranges between %C 4 to 6. The differences in C/N ratio in the different groups of soils still remain.

3) High slope section of the curves: it corresponds to the most mineral horizons in which decrease in the C/N ratio and N immobilization mainly taking place in the humic substances. In these horizons there are no important differences between the three types of soils studied.

The %C and C/N values which define the transition between organic horizons with net N mineralization and mineral horizons with N immobilization can be used for an objective definition of A1 horizons.

The %C - C/N curves prove to be quite sensitive to describe the mineralization for the different forest soils studied.